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National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
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November 11, 1992

NOAA SHIP MILLER FREEMAN
CRUISE NO. 92-08
ECHO INTEGRATION-MIDWATER TRAWL SURVEY OF WEST COAST PACIFIC WHITING

PRELIMINARY CRUISE RESULTS

CRUISE PERIOD, AREA, AND SCHEDULE

Scientists from the Alaska Fisheries Science Center (AFSC) conducted an echo integration-midwater trawl (EIMWT) survey of Pacific whiting (Merluccius productus) aboard the NOAA ship Miller Freeman from July 7 to August 19, 1992, for a total of 42 sea days. The cruise began and ended in Seattle, Washington. The area of operations included waters off the west coast of the United States from central California to the north end of Vancouver Island, British Columbia, Canada. The major objective was to provide data for the estimation of age-specific biomass and population numbers.

The vessel's itinerary was as follows:

Leg 1

July 7-8	Conducted gear tests and sphere calibration in Puget Sound.
July 9-26	Transited to San Luis Obispo, California. Surveyed the continental shelf of the U.S. Pacific Coast.
July 27-28	In port, Port Angeles, Washington. Scientific personnel changed.

Leg 2

July 29- August 17	Continued survey of the continental shelf of the United States and Canada. Intership calibration of acoustic systems with the Canadian survey vessel W. E. Ricker. Sphere calibration in Canadian waters.
August 18-19	In transit to Seattle. End of cruise.

OBJECTIVES

The principal objectives of the cruise were to:

1. Collect echo integration data and midwater and bottom trawl samples necessary to determine the distribution, biomass, and biological composition of Pacific whiting in the area of operations.

2. Collect whiting target strength data for use in scaling echo integration data to estimates of absolute abundance.

3. Collect acoustic and biological data to determine the distribution, relative density, and biological characteristics of shortbelly rockfish (Sebastes jordani) schools off the coast of California.

4. Collect tissue specimens and life history data on target rockfish species (Sebastes flavidus, S. diploproa, and S. jordani) with emphasis on traits that are potentially affected by advanced age and senescence.

5. Collect acoustic and biological data on the distribution and biological characteristics of rougheye (S. aleutianus) and shortraker (S. borealis) rockfish off the west coast of Washington and Vancouver Island.

6. Calibrate the acoustic system using standard sphere techniques and conduct an intership calibration with the Canadian research vessel W. E. Ricker.

7. Collect whiting stomach contents data for food habits studies.

8. Collect temperature and salinity profile data in areas of whiting abundance to compare with the vertical distribution of whiting schools.

9. Collect both vertebrate and invertebrate specimen samples for a study of the feeding energetics of marine mammals.

10. Collect fish specimens for the AFSC Observer Program fish identification training class.

11. Collect otoliths of canary (S. pinniger), yellowtail (S. flavidus), silvergray (S. brevispinus), and widow (S. entomelas) rockfish in Canadian waters for ageing work to be conducted by scientists at the Pacific Biological Station in Nanaimo, British Columbia.

VESSEL, ACOUSTIC EQUIPMENT, AND TRAWL GEAR

The survey was conducted on board the NOAA ship Miller Freeman, a 66-m (215-ft) stern trawler equipped for fisheries and oceanographic research. Acoustic data were collected with a quantitative echo sounding system (Simrad EK500[1]). A Simrad 38 kHz split-beam transducer was mounted on the distal end of the vessel's centerboard. The transducer was at a depth of 10 m below the surface of the water when the centerboard was fully extended. System electronics were housed in a portable laboratory mounted on the weather deck of the vessel. Data from the Simrad EK500 echo sounder/receiver were processed using Simrad BI500 echo integration and target strength data analysis software on a SUN workstation.

Midwater echo sign was sampled using a modified Northern Gold 1200 midwater rope trawl (NET Systems, Inc.). The trawl was constructed with ropes in the forward section and stretch mesh sizes ranging from 163 cm (64 in) immediately behind the rope section to 8.9 cm (3.5 in) in the cod end. It was fished in a bridleless configuration and was fitted with a 3.2-cm (1.25-in) mesh cod end liner. Headrope and footrope lengths were 94.5 m (310 ft) and 50 m (164 ft), respectively, and the breastlines measured 79.4 m (260.5 ft). The headrope length was measured between the points of attachment to the breastline. The footrope length was measured between the points where the tom weights were attached. The net was fished with 1.8-m X 2.7-m (6-ft X 9-ft) steel V-doors [1,000 kg (2,200 lb)] and 340-kg (750-lb) tom weights on each side. Trawl mouth opening and depth were monitored with a Furuno wireless netsounder system attached to the headrope of the trawl.

Two additional trawls were used. Fish on or near bottom were sampled with a nylon Nor'eastern bottom trawl equipped with 31.1-m (102-ft) long roller gear and 54.8-m (30-fm) triple dandylines. Net mesh sizes ranged from 12.7 cm (5 in) in the body to 8.9 cm (3.5 in) in the intermediate and cod end, with a 3.2-cm (1.25-in) cod end liner. Headrope and footrope lengths

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[1] Reference to trade names or commercial firms does not constitute endorsement by the National Marine Fisheries Service, NOAA.

were 27.4 m and 32.0 m (90 ft and 105 ft), respectively. Smaller organisms and juvenile fish in midwater were sampled with a Marinovich midwater trawl, with meshes measuring 7.6 cm (3.0 in) forward and 3.2 cm in the cod end, and a 0.32-cm (1/8-in) cod end liner. Headrope and footrope lengths were each 9.1 m (30 ft). The Marinovich trawl and the nylon Nor'eastern bottom trawl were fished with the same steel V-doors used with the rope trawl. Trawl mouth opening and depth were monitored with the Furuno netsounder system.

Water temperature/salinity profile data were collected at trawl and calibration sites using a Seabird CTD (conductivity/ temperature/depth) system. Expendable bathythermographs (XBT) were launched routinely during the survey period to provide additional temperature profile data.

SURVEY METHODS

The echo integration/midwater trawl survey was conducted during daylight hours (about 15 hours per day). Nighttime hours were used to collect whiting target strength data or to investigate aggregations of other midwater fish species, primarily rockfish. Echo integration data were collected continuously along a series of parallel transects at about 10-nautical mile spacing that extended east-west between the 30-fm and 250-fm depth contours (Fig. 1). Transect spacing was decreased to 5 nmi between 48° N and 49° N latitude to provide increased sampling in an area of historically high whiting abundance. In many areas, transects were extended beyond 250 fm to survey whiting found over deeper water. In the southernmost portion of the survey area from Pt. Estero to Monterey Bay and from Pt. Arena to Cape Mendocino, where the shelf was narrow, zigzag transects were used. Ship speed averaged about 12 knots. The acoustic system collected echo integration data and split-beam target strength data. The target strength data provided information about the acoustic characteristics of observed fish. These data will be interpreted together with historical target strength data and then used to scale echo integration data to provide estimates of surface density (kg/m^2).

Midwater and bottom trawl hauls were made at selected locations to identify echo sign and provide biological samples (Fig. 1). The average trawling speed was about 3 knots. Vertical net opening for the midwater rope trawl averaged about 22 m and ranged between 19 and 26 m. For the nylon Nor'eastern bottom trawl, the vertical opening averaged about 6 m and ranged between 4 and 8 m. Catches were sorted to provide estimates of weight and number by species for each haul. Whiting were further sampled to determine sex, length, body weight, ovary weight, age, maturity, and composition of stomach contents. Additional biological data (e.g., age structures, morphometric measurements,

meristic counts, tissue samples) were collected on the target rockfish species.

PRELIMINARY RESULTS

Standard Sphere Calibrations

Standard sphere calibrations were conducted in Port Susan, Washington, on July 8, at the start of the survey, and in Kendrick Inlet, Vancouver Island, on August 13, near the end of the survey. The vessel was anchored to minimize movement during the data collection. Acoustic measurements were made on a copper sphere suspended below the transducer. The standard sphere (38.6 mm diameter) had a known target strength of -33.6 dB. Split-beam target strength and echo integration data were collected with the Simrad EK500 system. Data were collected to describe transducer beam pattern characteristics by moving the standard sphere through the beam. During the first week of the survey, a problem was detected with a recently updated version of EK500 firmware. On July 15, this firmware was replaced with an earlier version, and an abbreviated sphere calibration was conducted in Drake's Bay, California, to confirm that the data acquisition system remained stable. No significant difference in the acoustic system parameters was observed between the three calibrations.

Intership Calibration

An intership calibration of the acoustic systems aboard the U.S. and Canadian research vessels was conducted on August 10 in an area centered near 48°45'N 126°15'W, about 40 nmi west of Barkley Sound, Vancouver Island. The vessels' navigational instruments were tested (using radar range and bearing measurements) to ensure that position information would be comparable. A total of 10 side-by-side transect pairs was completed at vessel speeds of 8-9 knots. The trailing vessel oriented itself 0.2 nmi astern and 0.2 nmi to one side of the lead boat. The vessels alternated lead position. Transects ranged in length from 7-10 nmi and were oriented in an east-west direction. Bottom depths in this area ranged between 150 and 500 m. Whiting densities were in the medium-high range. Results of this intercalibration work are not yet available.

Biological and Oceanographic Data Collection

Biological data were collected and specimen and tissue samples preserved along the entire west coast. Trawl station and catch data from the daytime whiting work and nighttime rockfish work are summarized in Tables 1 and 2, respectively. Pacific whiting was the dominant fish species captured in daytime midwater trawl hauls in all strata (Tables 3-8). Nighttime bottom trawl catches

were dominated by rockfish species (Tables 9 and 10). Tallies of biological data collected for whiting are presented in Table 11. Oceanographic data collection consisted of a total of 55 CTD casts (Table 12) and 41 XBT casts (Table 13).

Target Strength Data Collection

On seven different nights, both acoustic and biological conditions were suitable for the collection of whiting target strength data. The 14 target strength confirmation trawl hauls are indicated in Table 1. The percentage in numbers of whiting in each of these hauls ranged from 78 to 100%. These target strength data sets were collected from adult fish ranging in length from 40 to 64 cm.

EIMWT Survey

Aggregations of whiting were encountered along the coast from Point Sur, California, to the north end of Vancouver Island. Throughout most of the survey area low-density, 20- to 50-m thick bands of whiting were observed at depths of 150-350 m extending out over deeper waters. This caused us to extend some transects up to 20 miles beyond the 500-m bottom depth contour. South of Coos Bay, Oregon, whiting distribution was patchy with medium to low density aggregations occurring over bottom depths from 200 m to beyond 500 m. Midwater trawl catches south of San Francisco (hauls 3-5) were dominated by whiting with a modal length of 24.5 cm (Fig. 2A). In the area between Fort Bragg and Coos Bay, catches from midwater trawl hauls 8-16 consisted primarily of whiting between 25 and 35 cm with a few adults between 35 and 50 cm (Fig. 2B).

Most of the coastal whiting biomass was found north of Coos Bay. Midwater hauls were composed primarily of adult whiting > 40 cm (Fig. 2C-G). The larger fish (i.e., > 50 cm) were encountered in significant quantities only in Canadian waters. Off Oregon and Washington, concentrations of whiting were found over bottom depths as shallow as 60 m and extended beyond the continental shelf. Trawl catches in this area were dominated by male fish (Fig. 2C,D). Very little whiting echosign was detected on La Perouse or Swiftsure Banks off Vancouver Island--except in an area of deeper water off Barkley Sound where the Canadian joint venture fleet was fishing. The large female fish in the south Canada size composition (Fig. 2E) came from two trawl hauls off Barkley Sound. North of 49° N, whiting aggregations were strongly associated with the edge of the continental shelf at about 200 m. Aggregations of whiting were observed as far north as Cape Scott at the northern tip of Vancouver Island and in an area just west of Calvert Island.

Nighttime Rockfish Operations

Leg 1

Acoustic surveys on shortbelly rockfish schools were completed during night hours while in coastal waters off California. Confirmatory tows were conducted on targets from which the following information was collected: 1) size, age, and sex composition; 2) gonad maturity stage; 3) histology samples of gonads; and 4) assessment of physiological condition. A total of 551 shortbelly rockfish specimens were examined from 8 trawl catches. Information on splitnose rockfish (S. diploproa) was gathered from 6 trawl catches with a total of 49 specimens examined and subsampled for size, age, physiological condition, life history stage, gonad maturity stage, and pathology. A total of 70 yellowtail rockfish (S. flavidus) specimens from 8 trawl catches was examined for the same variables listed for splitnose rockfish. Complete necropsies were performed and histology tissue samples collected on two yellowtail rockfish that were affected by chromatophoromas. These external pigmented lesions have been found to correlate with generally poor physiological condition; inactive, retarded, or resorbed reproductive state; and other disease and parasite pathologies.

Leg 2

Detailed hydroacoustic data and biological samples were collected at 17 locations in coastal waters off Washington and Vancouver Island during night hours. The hydroacoustic data were collected for analysis of bottom relief, substrate hardness, and rockfish distribution near bottom. At each location, a bottom trawl haul was completed to collect the following biological information from shortraker and rougheye rockfish specimens: 1) length, weight, age, and sex composition; 2) gonads for a histological study of maturity stages; 3) tissue samples (liver, eyeball, and muscle tissue) for electrophoretic analysis; and 4) detailed morphometric measurements and meristic counts to determine within- and between-species differences. Seventeen bottom trawls were completed at depths ranging from 85 m to 601 m, with an average depth of 400 m. A total of 57 rougheye and 38 shortraker rockfish specimens were examined. Also, during Leg 2, a large number of fish specimens were collected for the AFSC Observer Program fish identification training class.

SCIENTIFIC PERSONNEL

Name	Sex/ Nationality	Position	Organization
Leg I (July 7-26, 1992)			
Taina Honkalehto	F/USA	Chief Scientist	AFSC
Dan Twohig	M/USA	Electronics Tech.	AFSC
Jim Traynor	M/USA	Fish. Biologist	AFSC
Dennis Benjamin	M/USA	Fish. Biologist	AFSC
Steve de Blois	M/USA	Fish. Biologist	AFSC
Martin Dorn	M/USA	Fish. Biologist	AFSC
Terrance Tinker	M/USA	Electronics Tech.	AFSC
Don Pearson	M/USA	Fish. Biologist	SWFSC
Mickey Eldridge	M/USA	Fish. Biologist	SWFSC
Kohji Iida	M/JAPAN	Assoc. Professor	HU
Douglas Weisman	M/USA	Teacher	SHS
Leg II (July 29-August 19, 1992)			
Neal Williamson	M/USA	Chief Scientist	AFSC
Dan Twohig	M/USA	Electronics Tech.	AFSC
Denise McKelvey	F/USA	Fish. Biologist	AFSC
Dennis Benjamin	M/USA	Fish. Biologist	AFSC
Steve de Blois	M/USA	Fish. Biologist	AFSC
Terrance Tinker	M/USA	Electronics Tech.	AFSC
Chris Wilson	M/USA	Fish. Biologist	AFSC
Dan Ito	M/USA	Fish. Biologist	AFSC
Dave Baker	M/USA	Fish. Biologist	AFSC
Ken Vandenheuvel	M/USA	Teacher	BEHS

AFSC - Alaska Fisheries Science Center, Seattle, Washington
HU - Hokkaido University, Hakadote, Hokkaido, Japan
SWFSC - Southwest Fisheries Science Center, Tiburon Laboratory, Tiburon, California
SHS - Shoreline High School, Seattle, Washington
BEHS - Burlington-Edison High School, Burlington, Washington

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Table 1. Summary of midwater trawl stations and catch data from the summer 1992 west coast EIMWT survey, Miller Freeman cruise 92-8.

HAUL NO.	AREA	DATE (1992)	TIME (PDT)	START POSITION LAT. (N)	START POSITION LONG. (W)	TEMP (C) GEAR	TEMP (C) SURF	DEPTH (M) GEAR	DEPTH (M) BOTM	CATCH (LBS/NOS.) PACIFIC WHITING	CATCH (LBS/NOS.) OTHER
1	SC	9 JUL	2324-2339	43 56.9	124 59.3	6.7	15.2	253	582	232/199	14/188
2	EU	10 JUL	1345-1428	41 45.1	124 44.3	6.4	12.1	281	841	72/70	13/118
3	MO	12 JUL	1830-1840	36 40.1	122 7.2	8.2	16.6	280	1695	986/5139	6/1
4	MO	13 JUL	1133-1211	36 57.5	122 28.2	7.7	16.9	271	520	748/3790	2102/7309
5	MO	14 JUL	1547-1553	37 30.1	123 0.6	7.4	16.7	277	351	1057/5224	1134/2984
* 6	MO	15 JUL	1510-1528	38 9.9	123 20.6	8.7	15.2	159	159	1470/2378	4330/24068
7	MO	15 JUL	1926-1947	38 10.0	123 29.6	7.2	16.3	362	468	12/19	40/33
8	MO	17 JUL	0839-0859	39 42.7	124 5.4	7.5	13.7	284	673	2793/7632	7/3
9	MO	17 JUL	1818-1835	40 23.1	124 39.1	7.6	13.6	251	949	412/827	18/15
10	EU	18 JUL	1753-1915	41 0.0	124 50.2	6.9	14.1	282	1015	617/1037	88/26
11	EU	19 JUL	0416-0427	41 0.5	124 25.4	7.4	13.5	316	375	32/33	7/10
12	EU	19 JUL	2147-2238	41 50.0	124 52.6	8.0	15.6	110	851	21/20	19/92
13	EU	20 JUL	1057-1143	42 11.7	124 36.8	7.7	15.3	232	301	5582/14020	218/51
14	EU	20 JUL	2107-2122	42 40.1	124 39.6	8.3	14.7	92	144	1121/2946	12/5
15	EU	21 JUL	0713-0723	42 49.9	124 45.1	8.1	14.2	143	183	5437/12578	3/2
16	SC	21 JUL	1427-1551	43 10.0	125 10.1	6.8	16.8	262	1564	1333/2013	44/5
17	SC	22 JUL	1953-2043	43 39.2	124 38.2	7.7	16.5	162	377	2897/2706	287/137
18	SC	22 JUL	2351-0016	43 43.1	124 29.1	8.3	15.7	116	124	444/369	354/306
19	SC	23 JUL	0950-1008	44 9.9	124 24.4	8.1	15.1	86	99	7825/6134	175/90
20	SC	23 JUL	1745-1826	44 29.4	124 52.9	7.2	15.7	254	414	597/541	57/33
21	SC	24 JUL	1117-1119	44 49.6	124 33.2	7.3	16.7	198	250	4535/3845	5/3
+ 22	SC	24 JUL	2305-0006	44 56.3	124 26.5	8.8	16.1	60	273	2/1	T/--
+ 23	SC	30 JUL	2022-2102	45 30.3	124 16.9	7.7	12.3	96	154	2503/2044	279/139
+ 24	SC	31 JUL	0322-0422	45 30.4	124 13.6	7.8	12.3	85	134	508/407	43/22
25	VA	31 JUL	1544-1559	45 50.1	124 26.2	7.4	14.2	124	153	2291/1887	78/57
26	VA	1 AUG	1223-1245	46 9.9	124 38.0	7.2	14.9	163	170	3417/2576	63/33
27	VA	1 AUG	1947-2031	46 19.9	124 16.3	7.5	14.3	69	82	352/273	49/7
28	VA	2 AUG	1251-1311	46 40.0	124 34.7	7.5	14.0	115	131	1334/1038	82/9
29	VA	3 AUG	0849-1002	47 0.0	125 13.0	6.2	16.0	238	1621	190/140	36/186
+ 30	VA	3 AUG	2109-2145	47 9.8	124 52.3	7.3	15.9	127	160	39/31	3/1
+ 31	VA	3 AUG	2354-0052	47 9.6	124 51.2	7.4	15.9	94	147	27/21	32/6

Table 1. (Cont.)

HAUL NO.	AREA	DATE (1992)	TIME (PDT)	START POSITION LAT. (N)	START POSITION LONG. (W)	TEMP (C) GEAR	TEMP (C) SURF	DEPTH (M) GEAR	DEPTH (M) BOTM	CATCH (LBS/NOS.) PACIFIC WHITING	CATCH (LBS/NOS.) OTHER
32	VA	4 AUG	0838-0900	47 20.0	124 54.0	7.2	14.8	185	917	857/641	9/5
+ 33	VA	4 AUG	1920-2001	47 39.6	124 44.3	7.6	14.5	65	81	2155/1664	10/6
34	VA	5 AUG	1547-1616	48 0.0	125 24.7	---	16.2	228	487	372/275	0
+ 35	VA	5 AUG	2142-2244	48 5.1	125 20.9	6.9	15.3	131	226	2147/1645	181/42
+ 36	VA	6 AUG	0504-0545	48 4.9	125 16.4	6.9	15.3	120	239	9369/7074	31/21
37	VA	6 AUG	1506-1519	48 9.9	125 10.0	7.4	15.7	165	273	12002/8832	98/114
38	CS	7 AUG	1029-1045	48 14.9	125 45.2	6.7	14.3	245	402	1679/1213	1/3
39	VA	7 AUG	2109-2112	48 25.6	125 3.8	7.4	15.2	81	120	1011/702	37/21
+ 40	VA	8 AUG	0059-0159	48 19.4	125 12.5	6.9	13.0	115	179	763/561	29/131
+ 41	VA	8 AUG	0444-0524	48 20.3	125 13.6	6.9	13.0	117	184	756/548	17/11
42	CS	8 AUG	1105-1113	48 25.0	125 47.4	6.8	12.6	127	141	845/602	40/22
43	VA	8 AUG	2159-2236	48 30.1	124 46.6	7.0	13.5	198	240	1307/1031	201/181
* 44	CS	9 AUG	0042-0053	48 29.8	125 0.1	7.2	13.2	95	95	0	1342/573
45	CS	9 AUG	1110-1123	48 35.1	126 10.2	6.8	14.7	170	324	7322/5304	28/7
46	CS	9 AUG	2131-2159	48 44.7	125 27.9	8.0	13.6	96	123	2985/1452	131/316
47	CS	11 AUG	1353-1400	48 55.0	125 46.0	8.6	14.2	93	107	295/117	2/5
48	CS	11 AUG	1938-2040	48 53.8	126 39.2	6.6	15.6	193	543	1708/1247	50/14
49	CN	12 AUG	1831-1844	49 19.6	127 11.3	7.7	14.7	223	271	8679/6788	1/1
50	CN	13 AUG	0833-0836	49 29.4	127 18.5	6.6	13.9	187	965	7853/5507	107/34
51	CN	14 AUG	1257-1352	49 49.9	127 32.8	6.8	13.1	76	93	0	13/1
52	CN	14 AUG	1619-1704	49 49.6	127 48.8	6.4	12.7	250	843	1317/892	3/1
53	CN	15 AUG	0637-0648	50 7.1	127 59.7	8.0	13.3	74	107	0	18/1
54	CN	15 AUG	0955-1006	50 8.9	128 8.9	5.9	13.6	268	530	1893/1277	136/31
55	CN	15 AUG	1816-1819	50 30.1	128 33.2	6.3	14.9	180	233	18973/11330	617/320
+ 56	CN	15 AUG	2240-2310	50 29.6	128 33.3	6.3	14.9	114	224	503/337	19/6
+ 57	CN	16 AUG	0432-0503	50 29.6	128 33.3	6.5	14.9	122	236	797/524	19/7
58	CN	16 AUG	0938-0940	50 40.0	128 52.6	5.9	13.4	204	225	5308/3133	92/43
59	CN	16 AUG	1638-1649	50 49.8	129 36.4	5.5	15.0	282	1386	2169/1221	6/16
60	CN	17 AUG	1644-1717	51 29.3	128 31.7	6.5	14.2	147	200	3663/1870	62/21
+ 61	CN	17 AUG	2114-2144	51 26.8	128 20.0	8.5	14.1	73	125	2390/1249	8/3
+ 62	CN	17 AUG	2247-2317	51 28.3	128 20.9	8.2	13.8	88	128	439/232	116/45

MO=Monterey INPFC region, EU=Eureka INPFC region, SC=South Columbia region, VA=Vancouver to North Columbia region, CS=South Canada region, CN=North Canada region
+ Target strength trawl
* Bottom trawl
T=trace (i.e., <0.5 lb)

Table 2. Summary of trawl stations and catch data from the nighttime rockfish work, Miller Freeman cruise 92-8.

HAUL NO.	AREA	DATE (1992)	TIME (PDT)	START POSITION LAT. (N)	START POSITION LONG. (W)	TEMP (C) GEAR	TEMP (C) SURF	DEPTH (M) GEAR	DEPTH (M) BOTM	CATCH (LBS/NOS.) SHORTBELLY ROCKFISH	CATCH (LBS/NOS.) SHORTRAKER ROCKFISH	CATCH (LBS/NOS.) ROUGHEYE ROCKFISH	CATCH (LBS/NOS.) OTHER
201	MO	12 JUL	2250-2301	36 47.2	122 3.6	8.4	16.3	193	340	1/1	0	0	8/43
202	MO	13 JUL	0245-0251	36 42.2	121 59.6	8.4	16.3	272	293	1/1	0	0	29/80
* 203	MO	13 JUL	2228-2244	37 28.0	122 56.9	8.4	16.4	201	201	270/1188	0	0	468/1927
204	MO	14 JUL	0234-0301	37 13.7	122 48.1	8.3	16.0	207	210	326/629	0	0	52/116
205	MO	15 JUL	0039-0055	37 48.2	123 12.0	9.6	16.9	52	71	0	0	0	6/1
206	MO	16 JUL	0231-0239	38 21.5	123 31.5	8.7	15.1	212	216	1265/2699	0	0	39/56
207	MO	18 JUL	0604-0608	40 24.6	124 33.3	8.7	11.6	105	113	0	0	0	0
208	EU	18 JUL	2352-0023	40 52.2	124 27.2	7.4	13.5	341	369	0	0	0	438/433
209	EU	20 JUL	0204-0247	41 48.1	124 23.9	9.0	14.3	46	92	0	0	0	35/106
210	EU	21 JUL	0308-0358	42 51.6	124 41.0	8.7	14.1	97	110	0	0	0	19/18
211	SC	22 JUL	0140-0156	43 2.7	124 48.9	8.1	12.0	99	127	0	0	0	13/12
212	SC	23 JUL	0508-0512	44 1.0	124 55.7	---	15.1	---	169	0	0	0	114/88
* 213	SC	24 JUL	0048-0118	44 25.2	124 37.8	7.8	14.4	118	118	0	0	0	555/815
* 301	SC	31 JUL	0101-0137	45 30.0	124 12.3	7.7	12.3	141	141	0	0	0	388/818
* 302	VA	1 AUG	0208-0229	46 2.8	124 44.5	6.3	14.9	336	336	0	0	0	645/727
* 303	VA	2 AUG	0220-0237	46 11.0	124 37.4	7.2	14.9	175	175	0	0	0	792/733
# 304	VA	2 AUG	0530-0546	46 10.3	124 40.5	6.4	15.2	389	594	0	0	0	7/6
* 305	VA	3 AUG	0349-0411	46 56.6	124 56.3	7.1	16.0	225	225	0	0	0	3906/3652
* 306	VA	4 AUG	0359-0428	47 13.4	124 58.3	6.0	15.9	404	404	0	10/1	0	326/683
* 307	VA	5 AUG	0303-0340	47 39.8	125 8.6	5.2	15.6	553	553	0	0	0	267/754
* 308	CS	7 AUG	0020-0059	48 17.3	125 55.3	5.9	12.9	356	356	0	0	0	728/694
* 309	CS	7 AUG	0350-0437	48 21.0	126 6.3	5.8	12.9	506	506	0	68/14	36/8	329/436
* 310	CS	11 AUG	0241-0321	48 49.3	126 38.0	5.2	15.8	558	558	0	24/2	0	279/288
* 311	CS	12 AUG	0045-0130	48 56.2	126 41.2	5.2	16.0	448	448	0	16/2	134/37	364/355
* 312	CS	12 AUG	0406-0437	48 55.9	126 42.0	5.2	15.9	474	474	0	24/3	13/4	137/217
* 313	CN	13 AUG	0433-0454	49 36.5	127 39.1	5.3	13.8	601	601	0	0	0	128/190
* 314	CN	14 AUG	0512-0542	49 39.5	127 39.3	5.1	12.9	575	575	0	0	0	361/386
* 315	CN	15 AUG	0035-0120	49 50.0	127 32.5	6.9	12.9	86	86	0	0	0	36/49
* 316	CN	16 AUG	2319-2349	51 3.3	129 43.8	5.0	14.8	503	503	0	133/18	53/16	180/245
* 317	CN	17 AUG	0245-0315	51 2.9	129 43.6	4.8	14.6	479	479	0	13/2	52/16	172/285

MO=Monterey INPFC region, EU=Eureka INPFC region, SC=South Columbia region, VA=Vancouver to North Columbia region, CS=South Canada region, CN=North Canada region
* Bottom trawl # Marinovich trawl Unmarked hauls nos. are midwater rope trawls.

Table 3. Summary of catch by species in 6 midwater rope trawls from the Monterey INPFC region during the summer 1992 west coast EIMWT survey, Miller Freeman cruise 92-8.

Species	Weight (lbs.)	Percent	Numbers	Percent
Shortbelly Rockfish (Sebastes jordani)	7,065.1	51.8	31,941	56.0
Pacific Whiting (Merluccius productus)	6,007.4	44.0	22,631	39.7
Stripetail Rockfish (Sebastes saxicola)	320.8	2.4	1,378	2.4
Chilipepper (Sebastes goodei)	74.3	0.5	58	0.1
California Market Squid (Loligo opalescens)	44.2	0.3	883	1.5
Spiny Dogfish (Squalus acanthias)	38.0	0.3	27	<.1
Splitnose Rockfish (Sebastes diploproa)	29.0	0.2	40	0.1
King-of-the-Salmon (Trachipterus altivelis)	22.5	0.2	3	<.1
Widow Rockfish (Sebastes entomelas)	10.0	0.1	4	<.1
English Sole (Pleuronectes vetulus)	7.8	0.1	14	<.1
Petrale Sole (Eopsetta jordani)	6.4	<.1	7	<.1
Myctophid Unidentified (Myctophidae)	4.0	<.1	--	---
Greenstriped Rockfish (Sebastes elongatus)	3.9	<.1	7	<.1
Basketstarfish (Gorgonocephalus caryi)	2.5	<.1	18	<.1
Jellyfish Unidentified (Scyphozoa)	2.3	<.1	2	<.1
Squid Unidentified (Teuthoida)	2.2	<.1	9	<.1
Pacific Argentine (Argentina sialis)	1.8	<.1	7	<.1
Salps Unidentified (Thaliacea)	0.7	<.1	--	---
Pacific Sanddab (Citharichthys sordidus)	0.4	<.1	4	<.1
Shrimp Unidentified (Decapoda)	0.1	<.1	3	<.1
Juvenile Rockfish Unidentified (Sebastes sp.)	0.1	<.1	1	<.1
Hatchetfish Unidentified (Sternoptychidae)	0.1	<.1	1	<.1
Eel Larvae Unidentified (Eel Leptocephalus sp.)	0.1	<.1	1	<.1
Totals	13,643.7	100.0	57,033	100.0

Table 4. Summary of catch by species in 7 midwater rope trawls from the Eureka INPFC region during the summer 1992 west coast EIMWT survey, Miller Freeman cruise 92-8.

Species	Weight (lbs.)	Percent	Numbers	Percent
Pacific Whiting (Merluccius productus)	12,882.8	97.3	30,704	99.4
Chinook Salmon (Oncorhynchus tshawytscha)	136.7	1.0	9	<.1
Jack Mackerel (Trachurus symmetricus)	95.9	0.7	48	0.2
Giant Squid (Moroteuthis robusta)	70.8	0.5	1	<.1
King-of-the-Salmon (Trachipterus altivelis)	23.5	0.2	3	<.1
Myctophid Unidentified (Myctophidae)	15.9	0.1	--	---
Squid Unidentified (Teuthoida)	4.0	<.1	103	0.3
Splitnose Rockfish (Sebastes diploproa)	3.5	<.1	5	<.1
Medusafish (Icichthys lockingtoni)	2.5	<.1	3	<.1
Jellyfish Unidentified (Scyphozoa)	1.9	<.1	22	0.1
Chub Mackerel (Scomber japonicus)	1.5	<.1	1	<.1
Brown Cat Shark(Apristurus brunneus)	1.3	<.1	1	<.1
Salps Unidentified (Thaliacea)	0.9	<.1	--	---
Longfin Dragonfish (Tactostoma macropus)	0.2	<.1	2	<.1
Popeye Blacksmelt (Bathylagus ochotensis)	0.1	<.1	1	<.1
Hatchetfish Unidentified (Sternoptychidae)	0.1	<.1	1	<.1
Shrimp Unidentified (Decapoda)	0.1	<.1	--	---
Totals	13,241.7	100.0	30,904	100.0

Table 5. Summary of catch by species in 10 midwater rope trawls from the South Columbia region during the summer 1992 west coast EIMWT survey, Miller Freeman cruise 92-8.

Species	Weight (lbs.)	Percent	Numbers	Percent
Pacific Whiting (Merluccius productus)	20,876.3	94.5	18,259	96.2
Jack Mackerel (Trachurus symmetricus)	744.6	3.4	363	1.9
Sharpchin Rockfish (Sebastes zacentrus)	291.5	1.3	266	1.4
Myctophid Unidentified (Myctophidae)	45.5	0.2	--	---
Yellowtail Rockfish (Sebastes flavidus)	48.6	0.2	16	0.1
Jellyfish Unidentified (Scyphozoa)	31.2	0.1	--	---
Chub Mackerel (Scomber japonicus)	24.7	0.1	21	0.1
Widow Rockfish (Sebastes entomelas)	10.5	<.1	3	<.1
Pacific Sanddab (Citharichthys sordidus)	8.0	<.1	13	0.1
Big Skate (Raja binoculata)	4.5	<.1	1	<.1
Salps Unidentified (Thaliacea)	4.5	<.1	--	---
Sea Anemone Unidentified (Actiniaria)	2.0	<.1	2	<.1
Chinook Salmon (Oncorhynchus tshawytscha)	2.0	<.1	1	<.1
American Shad (Alosa sapidissima)	2.0	<.1	1	<.1
Brown Cat Shark (Apristurus brunneus)	1.5	<.1	1	<.1
Dungeness Crab (Cancer magister)	1.5	<.1	1	<.1
Squid Unidentified (Teuthoida)	0.8	<.1	4	<.1
California Market Squid (Loligo opalescens)	0.6	<.1	5	<.1
Whitebait Smelt (Allosmerus elongatus)	0.3	<.1	1	<.1
Pandalid Shrimp Unidentified (Pandalidae)	0.3	<.1	18	0.1
Sea Cucumber Unidentified (Holothuroidea)	0.2	<.1	1	<.1
Smelt Unidentified (Osmeridae)	0.1	<.1	2	<.1
Wattled Eelpout (Lycodes palearis)	0.1	<.1	2	<.1
Totals	22,101.3	100.0	18,981	100.0

Table 6. Summary of catch by species in 17 midwater rope trawls from the North Columbia-Vancouver region during the summer 1992 west coast EIMWT survey, Miller Freeman cruise 92-8.

Species	Weight (lbs.)	Percent	Numbers	Percent
Pacific Whiting (Merluccius productus)	38,386.1	97.6	28,939	97.6
Spiny Dogfish (Squalus acanthias)	352.1	0.9	298	1.0
Jellyfish Unidentified (Scyphozoa)	187.8	0.5	---	---
Yellowtail Rockfish (Sebastes flavidus)	122.1	0.3	28	0.1
Big Skate (Raja binoculata)	120.0	0.3	1	<.1
Jack Mackerel (Trachurus symmetricus)	103.1	0.3	57	0.2
Sablefish (Anoplopoma fimbria)	16.5	<.1	8	<.1
Chub Mackerel (Scomber japonicus)	10.0	<.1	6	<.1
Black Rockfish (Sebastes melanostomus)	8.4	<.1	2	<.1
Chinook Salmon (Oncorhynchus tshawytscha)	7.3	<.1	1	<.1
Pacific Herring (Clupea pallasi)	7.1	<.1	27	0.1
Redstripe Rockfish (Sebastes proriger)	4.3	<.1	7	<.1
King-of-the-Salmon (Trachipterus altivelis)	3.0	<.1	2	<.1
Ocean Shrimp (Pandalus jordani)	2.8	<.1	--	---
Magistrate Armhook Squid (Berryteuthis magistrate)	2.5	<.1	1	<.1
Squid Unidentified (Teuthoida)	2.4	<.1	6	<.1
Myctophid Unidentified (Myctophidae)	2.1	<.1	171	0.6
Eulachon (Thaleichthys pacificus)	1.5	<.1	34	0.1
American Shad (Alosa sapidissima)	1.0	<.1	1	<.1
Shrimp Unidentified (Decapoda)	0.6	<.1	46	0.2
Walleye Pollock (Theragra chalcogramma)	0.5	<.1	1	<.1
Invertebrate Unidentified	0.5	<.1	--	---
Arrowtooth Flounder (Atheresthes stomias)	0.3	<.1	1	<.1
Salps Unidentified (Thaliacea)	0.8	<.1	12	<.1
Pacific Viperfish (Chauliodus macouni)	0.1	<.1	2	<.1
Flathead Sole (Hippoglossoides elassodon)	0.1	<.1	1	<.1
Totals	39,343.0	100.0	29,652	100.0

Table 7. Summary of catch by species in 6 midwater rope trawls from the South Canada region during the summer 1992 west coast EIMWT survey, Miller Freeman cruise 92-8.

Species	Weight (lbs.)	Percent	Numbers	Percent
Pacific Whiting (Merluccius productus)	14,833.0	98.3	9,935	96.4
Jack Mackerel (Trachurus symmetricus)	70.8	0.5	27	0.3
Yellowtail Rockfish (Sebastes flavidus)	68.0	0.5	17	0.2
Spiny Dogfish (Squalus acanthias)	42.8	0.3	21	0.2
Jellyfish Unidentified (Scyphozoa)	24.8	0.2	9	0.1
Eulachon (Thaleichthys pacificus)	18.5	0.1	264	2.6
Chub Mackerel (Scomber japonicus)	11.5	0.1	7	0.1
Redstripe Rockfish (Sebastes proriger)	5.8	<.1	5	<.1
Pacific Herring (Clupea pallasi)	3.6	<.1	9	0.1
Chinook Salmon (Oncorhynchus tshawytscha)	3.5	<.1	1	<.1
Shortspine Thornyhead (Sebastolobus alascanus)	2.0	<.1	3	<.1
Walleye Pollock (Theragra chalcogramma)	1.6	<.1	4	<.1
Totals	15,085.9	100.0	10,302	100.0

Table 8. Summary of catch by species in 14 midwater rope trawls from the North Canada region, including the area west of Calvert Island, during the summer 1992 west coast EIMWT survey, Miller Freeman cruise 92-8.

Species	Weight (lbs.)	Percent	Numbers	Percent
Pacific Whiting (Merluccius productus)	53,682.4	97.8	34,360	98.5
Yellowtail Rockfish (Sebastes flavidus)	504.7	0.9	144	0.4
Yellowmouth (Sebastes reedi)	397.0	0.7	183	0.5
Redstripe Rockfish (Sebastes proriger)	189.3	0.3	148	0.4
Jellyfish Unidentified (Scyphozoa)	33.4	0.1	---	---
Pacific Ocean Perch (Sebastes alutus)	29.2	0.1	12	<.1
Silvergray Rockfish (Sebastes brevispinis)	23.0	<.1	5	<.1
Shortraker Rockfish (Sebastes borealis)	12.5	<.1	1	<.1
Arrowtooth Flounder (Atheresthes stomias)	10.8	<.1	1	<.1
Widow Rockfish (Sebastes entomelas)	6.0	<.1	2	<.1
Squid Unidentified (Teuthoida)	4.1	<.1	3	<.1
Walleye Pollock (Theragra chalcogramma)	3.0	<.1	1	<.1
Jack Mackerel (Trachurus symmetricus)	1.5	<.1	1	<.1
Eulachon (Thaleichthys pacificus)	0.4	<.1	6	<.1
Pacific Herring (Clupea pallasi)	0.3	<.1	1	<.1
Myctophid Unidentified (Myctophidae)	0.2	<.1	13	<.1
Ocean Shrimp (Pandalus jordani)	0.1	<.1	1	<.1
Medusafish (Icichthys lockingtoni)	0.1	<.1	1	<.1
Totals	54,898.0	100.0	34,886	100.0

Table 9. Summary of catch by species in 13 trawls targeting on rockfish during leg 1 of the summer 1992 west coast EIMWT survey, Miller Freeman cruise 92-8.

Species	Weight (lbs.)	Percent	Numbers	Percent
Shortbelly Rockfish (Sebastes jordani)	1,861.9	51.2	4,518	55.2
Pacific Whiting (Merluccius productus)	575.8	15.8	537	6.6
Yellowtail Rockfish (Sebastes flavidus)	217.1	6.0	73	0.9
English Sole (Parophrys vetulus)	148.5	4.1	310	3.8
Stripetail Rockfish (Sebastes saxicola)	140.3	3.9	931	11.4
Chilipepper (Sebastes goodei)	135.8	3.7	135	1.6
Rex Sole (Glyptocephalus zachirus)	106.1	2.9	420	5.1
Dover Sole (Microstomus pacificus)	104.5	2.9	252	3.1
Pacific Sanddab (Cotharichthys sordidus)	62.5	1.7	233	2.8
Petrale Sole (Eopsetta jordani)	43.0	1.2	48	0.6
Slender Sole (Lyopsetta exilis)	33.4	0.9	406	5.0
Spotted Ratfish (Hydrolagus colliei)	31.8	0.9	27	0.3
Canary Rockfish (Sebastes pinniger)	22.9	0.6	6	0.1
Splitnose Rockfish (Sebastes diploproa)	18.5	0.5	15	0.2
Sablefish (Anoplopoma fimbria)	16.2	0.4	14	0.2
Pacific Halibut (Hippoglossus stenolepis)	14.9	0.4	2	<.1
Skate Unidentified (Rajidae)	14.0	0.4	4	<.1
Pacific Electric Ray (Torpedo californica)	11.3	0.3	3	<.1
Spiny Dogfish (Squalus acanthias)	9.8	0.3	7	0.1
Pacific Cod (Gadus macrocephalus)	9.0	0.2	2	<.1
Brown Cat Shark (Apristurus brunneus)	8.5	0.2	7	0.1
Jack Mackerel (Trachurus symmetricus)	7.6	0.2	5	0.1
Greenstriped Rockfish (Sebastes elongatus)	6.0	0.2	8	0.1
Arrowtooth Flounder (Atheresthes stomias)	5.1	0.1	2	<.1
Widow Rockfish (Sebastes entomelas)	4.5	0.1	3	<.1
Shortspine Thornyhead (Sebastolobus alascanus)	4.0	0.1	1	<.1
Squid Unidentified (Teuthoida)	3.3	0.1	57	0.7
Magistrate Armhook Squid (Berryteuthis magister)	3.1	0.1	62	0.8
Jellyfish Unidentified (Scyphozoa)	2.5	0.1	2	<.1
Bocaccio (Sebastes paucispinis)	2.5	0.1	1	<.1
Sea Urchin Unidentified (Echinoidea)	2.1	0.1	26	0.3
Rock Sole (Pleuronectes bilineata)	1.7	<.1	1	<.1
Shrimp Unidentified (Decapoda)	1.5	<.1	--	---

Table 9. (Cont.)

Species	Weight (lbs.)	Percent	Numbers	Percent
Starfish Unidentified (Asteroidea)	1.4	<.1	--	---
Coho Salmon (Oncorhynchus kisutch)	1.0	<.1	1	<.1
Rosethorn Rockfish (Sebastes helvomaculatus)	1.0	<.1	1	<.1
Eelpout Unidentified (Zoarcidae)	0.9	<.1	7	0.1
Sharpchin Rockfish (Sebastes zacentrus)	0.8	<.1	2	<.1
Hydroid Unidentified (Hydrozoa)	0.6	<.1	7	0.1
Natica sp. (Naticidae)	0.5	<.1	3	<.1
Darkblotched Rockfish (Sebastes crameri)	0.5	<.1	1	<.1
Sea Cucumber Unidentified (Holothuroidea)	0.4	<.1	2	<.1
Myctophid Unidentified (Myctophidae)	0.3	<.1	13	0.2
Night Smelt (Spirinchus starksi)	0.3	<.1	12	0.1
Basketstarfish (Gorgonocephalus caryi)	0.3	<.1	5	0.1
Box Crab (Lopholithodes foraminatus)	0.3	<.1	1	<.1
Polychaete Worm Unidentified (Polychaeta)	0.3	<.1	1	<.1
Longfin Dragonfish (Tactostoma macropus)	0.2	<.1	3	<.1
Whitebait Smelt (Allosmerus elongatus)	0.1	<.1	1	<.1
Rockfish Unidentified (Sebastes sp.)	0.1	<.1	1	<.1
Sea Anemone Unidentified (Actiniaria)	0.1	<.1	1	<.1
Polyclad Flatworm Unidentified (Polycladida)	0.1	<.1	1	<.1
Salps Unidentified (Thaliacea)	0.1	<.1	1	<.1
Totals	3,639.0	100.0	8,182	100.0

Table 10. Summary of catch by species in 17 trawls targeting on rockfish during leg 2 of the summer 1992 west coast EIMWT survey, Miller Freeman cruise 92-8.

Species	Weight (lbs.)	Percent	Numbers	Percent
Pacific Ocean Perch (Sebastes alutus)	2,399.5	24.9	1,254	12.7
Pacific Whiting (Merluccius productus)	1,788.1	18.6	1,312	13.3
Sharpchin Rockfish (Sebastes zacentrus)	1,255.0	13.0	2,014	20.5
Dover Sole (Microstomus pacificus)	1,118.1	11.6	1115	11.3
Shortspine Thornyhead (Sebastolobus alascanus)	748.1	7.8	1,487	15.1
Sablefish (Anoplopoma fimbria)	443.6	4.6	123	1.2
Rougheye Rockfish (Sebastes aleutianus)	287.7	3.0	81	0.8
Shortraker Rockfish (Sebastes borealis)	286.8	3.0	42	0.4
Skate Unidentified (Rajidae)	203.4	2.1	23	0.2
Yellowmouth Rockfish (Sebastes reedi)	174.0	1.8	39	0.4
Rex Sole (Glyptocephalus zachirus)	167.3	1.7	537	5.5
Arrowtooth Flounder (Atheresthes stomias)	91.0	0.9	18	0.2
Longspine Thornyhead (Sebastolobus altivelis)	62.8	0.7	543	5.5
Sponge Unidentified (Porifera)	47.0	0.5	--	---
Squid Unidentified (Teuthoida)	42.7	0.4	49	0.5
Grenadier Unidentified (Macrouridae)	36.1	0.4	29	0.3
Slender Sole (Lyopsetta exilis)	33.2	0.3	473	4.8
Lingcod (Ophiodon elongatus)	32.3	0.3	7	0.1
Jellyfish Unidentified (Scyphozoa)	31.2	0.3	--	---
Eelpout Unidentified (Zoarcidae)	31.1	0.3	154	1.6
Spotted Ratfish (Hydrolagus colliei)	25.1	0.3	20	0.2
Darkblotched Rockfish (Sebastes crameri)	25.1	0.3	15	0.2
Rosethorn Rockfish (Sebastes helvomaculatus)	23.2	0.2	69	0.7
Tanner Crab Unidentified (Chionoecetes sp.)	22.4	0.2	18	0.2
Greenstriped Rockfish (Sebastes elongatus)	19.5	0.2	51	0.5
Pacific Cod (Gadus macrocephalus)	19.0	0.2	4	<.1
Sea Anemone Unidentified (Actiniaria)	18.8	0.2	--	---
Sea Urchin Unidentified (Echinoidea)	16.0	0.2	--	---
Brown Cat Shark (Apristurus brunneus)	15.5	0.2	14	0.1
Splitnose Rockfish (Sebastes diploproa)	14.8	0.2	17	0.2
Sea Cucumber Unidentified (Holothuroidea)	13.8	0.1	49	0.5
Aurora Rockfish (Sebastes aurora)	13.3	0.1	8	0.1
King-of-the-Salmon (Trachipterus altivelis)	12.5	0.1	2	<.1

Table 10. (Cont.)

Species	Weight (lbs.)	Percent	Numbers	Percent
Shrimp Unidentified (Decapoda)	12.2	0.1	--	---
Spiny Dogfish (Squalus acanthias)	10.8	0.1	7	0.1
Starfish Unidentified (Asteroidea)	7.6	0.1	--	---
Myctophid Unidentified (Myctophidae)	6.3	0.1	--	---
Octopus Unidentified (Octopodidae)	5.5	0.1	11	0.1
Petrale Sole (Eopsetta jordani)	5.5	0.1	6	0.1
Miscellaneous Invertebrates	5.4	0.1	--	---
American Shad (Alosa sapidissima)	4.0	<.1	2	<.1
Snail Unidentified (Gastropoda)	3.2	<.1	63	0.6
Redbanded Rockfish (Sebastes babcocki)	3.2	<.1	8	0.1
English Sole (Parophrys vetulus)	3.2	<.1	4	<.1
Quillback Rockfish (Sebastes maliger)	3.0	<.1	1	<.1
Silvergray Rockfish (Sebastes brevispinis)	3.0	<.1	1	<.1
Pacific Herring (Clupea pallasi)	2.8	<.1	14	0.1
Magistrate Armhook Squid (Berryteuthis magister)	2.8	<.1	3	<.1
Redstripe Rockfish (Sebastes proriger)	2.7	<.3	13	<.1
Pacific Flatnose (Antimora microlepis)	2.0	<.1	6	0.1
Widow Rockfish (Sebastes entomelas)	2.0	<.1	1	<.1
Sculpin Unidentified (Cottidae)	1.9	<.1	12	0.1
Dragonfish Unidentified (Melanostomiidae)	1.8	<.1	16	0.2
Snailfish Unidentified (Cyclopteridae)	1.5	<.1	13	0.1
Dungeness Crab (Cancer magister)	1.3	<.1	1	<.1
Slickhead Unidentified (Alepocephalidae)	1.2	<.1	19	0.2
Salps Unidentified (Thaliacea)	1.0	<.1	11	0.1
Kelp Greenling (Hexagrammos decagrammus)	1.0	<.1	1	<.1
Brittlestarfish Unidentified (Ophiuroidea)	0.9	<.1	--	---
Viperfish Unidentified (Chauliodontidae)	0.8	<.1	22	0.2
Eulachon (Thaleichthys pacificus)	0.5	<.1	14	0.1
Flathead Sole (Hippoglossoides elassodon)	0.5	<.1	2	<.1
Coral Unidentified (Gorgonacea)	0.5	<.1	--	---
Snipe Eel Unidentified (Nemichthyidae)	0.3	<.1	6	0.1
Hagfish Unidentified (Myxinidae)	0.3	<.1	1	<.1
Crinoid Unidentified (Crinoidea)	0.2	<.1	4	<.1
Longhorned Decorator Crab (Oregonia gracilis)	0.2	<.1	2	<.1
Poacher Unidentified (Agonidae)	0.2	<.1	2	<.1
Hermit Crab Unidentified (Paguridae)	0.2	<.1	2	<.1

Table 10. (Cont.)

Species	Weight (lbs.)	Percent	Numbers	Percent
Comb Jelly Unidentified (Ctenophora)	0.2	<.1	--	---
Gonostoma sp. (Gonostomatidae)	0.1	<.1	3	<.1
Crested Bigscale (Poromitra crassiceps)	0.1	<.1	1	<.1
Deep Sea Smelt Unidentified (Bathylagidae)	0.1	<.1	1	<.1
Northern Ronquil (Ronquilus jordani)	0.1	<.1	1	<.1
Hydroid Unidentified (Hydrozoa)	0.1	<.1	1	<.1
Tunicate Unidentified (Ascidiacea)	0.1	<.1	1	<.1
Sea Pen Unidentified (Pennatulacea)	0.1	<.1	1	<.1
Isopod Unidentified (Isopoda)	0.1	<.1	--	---
Totals	9,618.5	100.0	9,844	100.0

Table 11. Summary of biological samples and measurements from the summer 1992 west coast EIMWT survey, Miller Freeman cruise 92-8.

	PACIFIC WHITING							
HAUL NO.	LENGTH	OTOLITH	MATURITY	FISH WGT	OVARY WGT	STOMACH SCAN	ROCKFISH OTOLITH	MISC. FROZEN SPECIMEN
1	199	0	0	0	0	0	0	0
2	70	0	0	0	0	0	0	0
3	172	25	100	100	0	10	0	3
4	467	25	75	75	0	0	0	33
5	89	0	0	0	0	10	0	0
6	206	61	61	61	0	10	0	19
7	0	0	0	0	0	0	0	1
8	315	55	105	105	0	0	0	0
9	279	50	50	50	0	10	0	7
10	407	101	101	101	0	0	0	16
11	0	0	0	0	0	0	0	0
12	20	0	0	0	0	0	0	87
13	398	103	103	103	0	0	0	0
14	197	67	67	67	0	10	0	1
15	384	108	108	108	0	10	0	0
16	338	61	61	61	0	11	0	3
17	334	69	69	69	0	0	0	0
18	369	0	56	0	0	0	0	0
19	350	114	114	114	0	10	0	8
20	314	100	100	100	0	10	0	0
21	299	100	100	100	0	0	0	0
22	0	0	0	0	0	0	0	0
23	358	101	101	101	0	0	0	0
24	307	100	100	100	0	0	0	0
25	316	100	100	100	0	10	0	2
26	309	100	100	100	0	10	0	3
27	273	82	82	82	0	12	0	3
28	289	101	101	101	0	10	0	1
29	140	100	100	100	0	10	0	14
30	31	31	31	31	0	10	0	0

Table 11. (cont.)

HAUL NO.	PACIFIC WHITING LENGTH	PACIFIC WHITING OTOLITH	PACIFIC WHITING MATURITY	PACIFIC WHITING FISH WGT	PACIFIC WHITING OVARY WGT	PACIFIC WHITING STOMACH SCAN	ROCKFISH OTOLITH	MISC. FROZEN SPECIMEN
31	21	0	0	0	0	0	0	0
32	337	100	100	100	17	10	0	0
33	334	100	100	100	0	10	0	1
34	272	100	100	100	1	10	0	0
35	273	0	114	114	0	0	0	0
36	415	1	1	1	0	0	0	0
37	287	100	100	100	0	10	0	0
38	320	100	100	100	0	10	0	0
39	401	98	98	98	0	10	0	0
40	367	98	98	98	0	12	0	0
41	302	1	102	102	12	0	0	3
42	315	100	100	100	0	10	0	2
43	314	100	100	100	0	10	0	0
44	0	0	0	0	0	0	35	0
45	366	100	100	100	0	10	6	0
46	267	100	100	100	0	10	0	7
47	117	100	100	100	48	10	0	4
48	379	100	100	100	0	10	10	0
49	317	100	100	100	21	10	0	1
50	332	101	101	101	1	0	29	0
51	0	0	0	0	0	0	0	0
52	299	102	102	102	11	10	0	0
53	0	0	0	0	0	0	0	0
54	296	97	97	97	5	10	6	1
55	232	0	0	0	0	0	4	4
56	240	97	97	97	0	10	0	0
57	329	44	44	44	0	10	1	0
58	280	95	95	95	4	10	0	2
59	326	100	100	100	9	10	0	0
60	335	100	100	100	8	10	0	1
61	317	100	100	100	7	10	0	0
62	232	0	0	0	0	0	0	5
Total	15,852	3,988	4,434	4,378	144	375	91	232

Table 12. Inventory of CTD casts from the summer 1992 west coast EIMWT survey, Miller Freeman cruise 92-8.

CAST	HAUL	DATE (1992)	TIME (PDT)	POSITION LAT (N)	POSITION LONG (W)	DEPTH (m) CAST/BOTM	COMMENT
1	--	Jul 08	0457	48 09.5	122 26.5	71/73	cal Port Susan
2	1	Jul 10	0106	43 57.4	124 59.2	473/575	WC TS-9
3	2	Jul 10	1538	41 47.2	124 44.6	393/835	WC TS-12
4	3	Jul 12	1943	36 39.6	122 06.8	348/2193	WC Tr. 8.0
5	202	Jul 13	0351	36 42.3	121 59.5	243/256	Rockfish Ops
6	4	Jul 13	1334	36 57.3	122 26.3	418/831	WC Tr. 11.0
7	203	Jul 13	2331	37 26.8	122 56.5	220/230	Rockfish Ops
8	5	Jul 14	1702	37 30.5	123 00.7	330/347	WC Tr. 15.0
9	6	Jul 15	1636	38 09.7	123 21.7	153/163	WC Tr. 19.0
10	7	Jul 15	2038	38 10.3	123 30.6	457/465	WC Tr. 19.0
11	206	Jul 16	0330	38 20.9	123 30.5	205/215	Rockfish Ops
12	--	Jul 17	0446	39 40.1	124 05.0	250/713	Rockfish Ops
13	8	Jul 17	1018	39 41.6	124 04.9	424/750	WC Tr. 27.0
14	9	Jul 17	1945	40 22.2	124 39.9	397/1800	WC Tr. 32.0
15	--	Jul 17	2058	40 22.6	124 34.3	413/573	WC Tr. 32.0
16	207	Jul 18	0657	40 23.7	124 35.1	405/1000	Rockfish Ops
17	10	Jul 18	2008	40 59.9	124 45.2	405/700	WC Tr. 36.0
18	208	Jul 19	0111	40 50.7	124 29.0	297/413	Rockfish Ops
19	12	Jul 19	2322	41 50.0	124 46.2	398/762	WC Tr. 41.0
20	209	Jul 20	0322	41 46.6	124 22.5	76/98	Rockfish Ops
21	14	Jul 20	2221	42 40.1	124 40.7	141/149	WC Tr. 46.0
22	210	Jul 21	0445	42 55.0	124 41.3	72/115	Rockfish Ops
23	211	Jul 22	0303	43 04.1	124 51.7	106/220	Rockfish Ops
24	17	Jul 22	2139	43 39.0	124 41.2	299/440	WC Tr. 54.0
25	23	Jul 30	2204	45 29.6	124 14.2	135/143	WC Tr. 63.0
26	25	Jul 31	1700	45 50.0	124 25.2	134/148	WC Tr. 65.0
27	302	Aug 01	0353	46 02.2	124 46.0	306/328	Rockfish Ops
28	26	Aug 01	1342	46 09.9	124 36.3	157/162	WC Tr. 67.0
29	27	Aug 01	2114	46 19.8	124 19.1	72/84	WC Tr. 68.0
30	303	Aug 02	0336	46 12.0	124 37.3	166/174	Rockfish Ops
31	28	Aug 02	1358	46 39.8	124 33.0	115/123	WC Tr. 70.0
32	305	Aug 03	0530	46 56.6	124 57.1	191/201	Rockfish Ops
33	29	Aug 03	1116	47 00.0	125 18.3	398/1707	WC Tr. 72.0
34	30,31	Aug 03	2235	47 10.1	124 55.2	155/167	WC Tr. 73.0
35	306	Aug 04	0541	47 14.4	124 59.7	408/415	Rockfish Ops
36	32	Aug 04	1003	47 20.2	124 55.8	417/1100	WC Tr. 74.0
37	33	Aug 04	2053	47 40.0	124 47.5	74/82	WC Tr. 76.0
38	307	Aug 05	0511	47 38.2	125 09.5	498/562	Rockfish Ops
39	35,36	Aug 05	2339	48 05.0	125 17.7	224/24	WC Tr. 79.0
40	308	Aug 07	0217	48 17.7	125 57.2	407/412	Rockfish Ops
41	40,41	Aug 08	0325	48 19.7	125 16.7	154/180	WC Tr. 82.0
42	42	Aug 08	1207	48 25.2	125 46.6	130/135	WC Tr. 83.0
43	44	Aug 09	0245	48 29.8	125 00.4	84/90	WC Tr. 84.0
44	45	Aug 09	1256	48 35.1	126 10.4	398/491	WC Tr. 85.0
45	46	Aug 10	0044	48 44.8	125 31.3	126/132	WC Tr. 87.0
46	310	Aug 11	0451	48 47.1	126 37.8	493/634	Rockfish Ops
47	47	Aug 11	1443	48 54.9	125 45.1	97/102	WC Tr. 89.0
48	48	Aug 11	2149	48 55.1	126 40.0	477/580	WC Tr. 89.0

Table 12. (Cont.)

CAST	HAUL	DATE (1992)	TIME (PDT)	POSITION LAT (N)	POSITION LONG (W)	DEPTH (m) CAST/BOTM	COMMENT
49	50	Aug 13	1012	49 29.7	127 18.5	415/955	WC Tr. 93.0
50	--	Aug 13	1921	49 42.5	126 38.0	57/69	cal Kendrick In.
51	314	Aug 14	0653	49 40.5	127 40.5	486/510	Rockfish Ops
52	55	Aug 15	2002	50 30.0	128 36.5	497/990	WC Tr. 99.0
53	58	Aug 16	1055	50 40.3	128 52.4	205/220	WC Tr. 100.0
54	59	Aug 16	1759	50 49.6	129 35.1	483/1056	WC Tr. 101.0
55	317	Aug 17	0426	51 04.3	129 44.0	497/600	Rockfish Ops

WC = West Coast
Tr. = Transect
TS = Transect Southbound
Rockfish Ops = nighttime rockfish operations

Table 13. Inventory of XBT casts from the summer 1992 west coast EIMWT survey, Miller Freeman cruise 92-8.

DROP NO.	HAUL	DATE (1992)	TIME (PDT)	POSITION LAT (N)	POSITION LONG (W)	BOTTOM DEPTH (m)	COMMENTS
01	13	Jul 20	1210	42 08.7	124 36.6	293	WC Tr. 43.0
02	15	Jul 21	0751	42 49.4	124 46.9	241	WC Tr. 47.0
03	16	Jul 21	1618	43 10.0	125 04.0	1260	WC Tr. 49.0
04	18	Jul 23	0053	43 45.6	124 28.8	122	WC Tr. 54.0
05	212	Jul 23	0534	44 00.1	124 55.6	178	Rockfish Ops
06	19	Jul 23	1038	44 09.3	124 26.2	100	WC Tr. 55.0
07	20	Jul 23	1858	44 31.9	124 54.3	440	WC Tr. 57.0
08	213	Jul 24	0151	44 27.2	124 36.0	117	Rockfish Ops
09	21	Jul 24	1207	44 49.4	124 34.5	282	WC Tr. 59.0
10		--BAD DROP!--					
11	304	Aug 02	0642	46 15.2	124 40.2	>1000	Rockfish Ops
12	34	Aug 05	1359	48 00.0	125 31.4	157	WC Tr. 78.0
13	--	Aug 05	1933	48 05.0	125 02.6	295	WC Tr. 79.0
14		--BAD DROP!--					
15	37	Aug 06	1621	48 10.2	125 10.1	158	WC Tr. 80.0
16	38	Aug 07	1145	48 14.9	125 43.8	560	WC Tr. 81.0
17	39	Aug 07	2132	48 25.7	125 02.5	177	WC Tr. 83.0
18	43	Aug 08	2300	48 30.2	124 50.4	221	WC Tr. 84.0
19		--BAD DROP!--					
20		--BAD DROP!--					
21	311	Aug 12	0535	48 55.5	126 43.9	559	Rockfish Ops
22	49	Aug 12	1938	49 20.1	127 12.7	240	WC Tr. 92.0
23	313	Aug 13	0549	49 36.8	127 39.2	600	Rockfish Ops
24	--	Aug 13	1143	49 30.1	127 01.5	121	WC Tr. 93.0
25	--	Aug 14	1000	49 40.0	127 11.9	120	WC Tr. 94.0
26	51,52	Aug 14	1431	49 49.9	127 43.5	500	WC Tr. 95.0
27	--	Aug 14	2112	50 00.0	127 47.0	416	WC Tr. 96.0
28	54	Aug 15	0820	50 09.6	128 07.5	500	WC Tr. 97.0
29	--	Aug 15	1337	50 20.0	128 19.6	500	WC Tr. 98.0
30	--	Aug 15	1507	50 29.8	128 19.5	122	WC Tr. 99.0
31	--	Aug 16	1406	50 49.9	129 15.5	120	WC Tr. 101.0
32	316	Aug 17	0027	51 05.3	129 42.9	571	Rockfish Ops
33	--	Aug 17	0617	50 59.9	129 20.5	181	WC Tr. 102.0
34	--	Aug 17	0640	50 59.9	129 26.8	215	WC Tr. 102.0
35	--	Aug 17	0747	51 00.0	129 47.5	550	WC Tr. 102.0
36	--	Aug 17	1011	51 10.0	130 01.6	595	WC Tr. 103.0
37	--	Aug 17	1216	51 09.4	129 18.4	265	WC Tr. 103.0
38	60	Aug 17	1533	51 25.2	128 28.1	188	WC Tr. 104.0
39	--	Aug 17	1923	51 37.9	128 30.5	152	WC Tr. 105.0
40		--BAD DROP!--					
41	61,62	Aug 17	2219	51 29.4	128 20.4	167	WC Tr. 105.0

WC = West Coast
Tr. = Transect
Rockfish Ops = nighttime rockfish operations

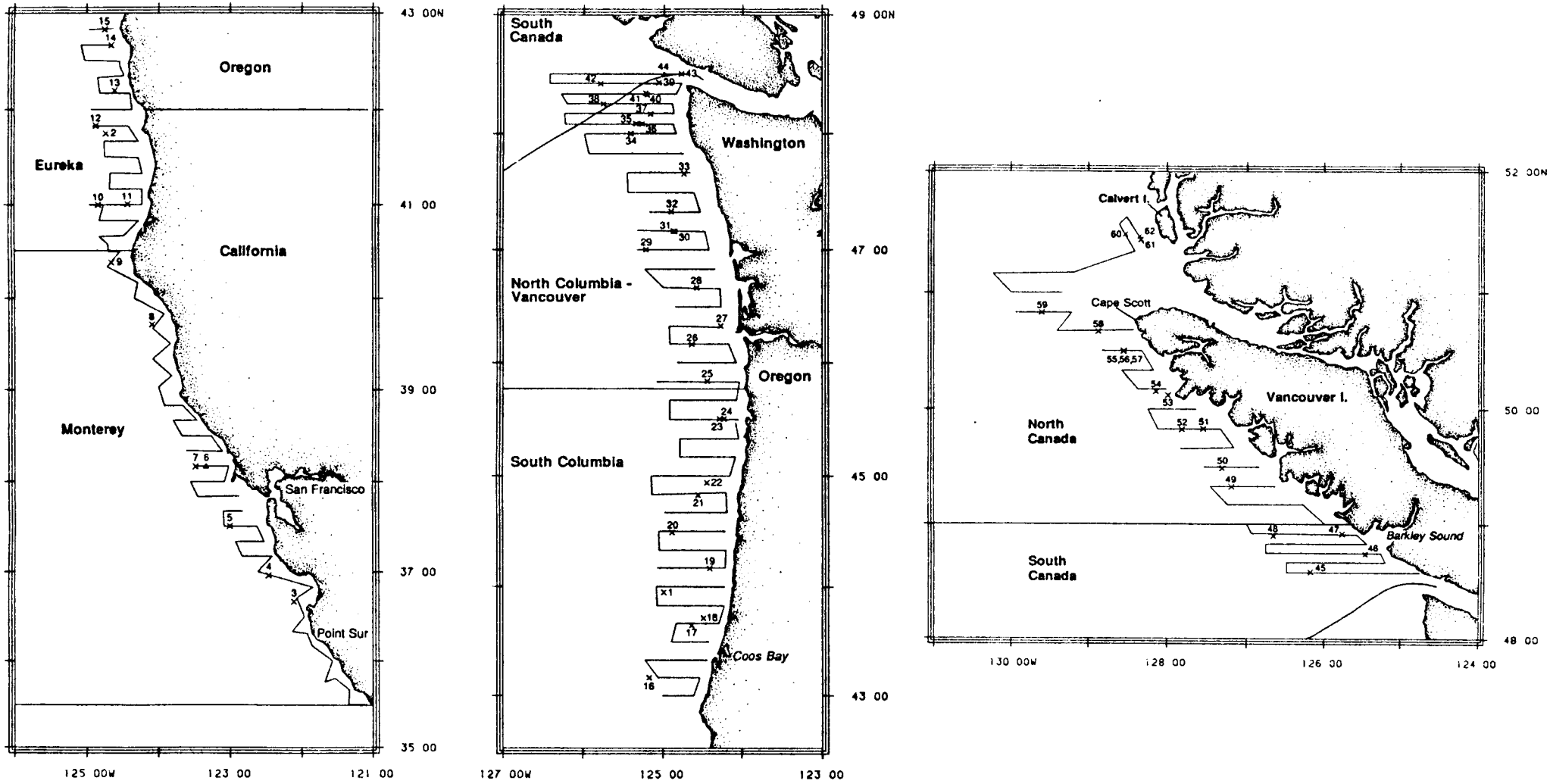

Figure 1. Survey trackline, midwater (x) and demersal (▵) trawl haul locations, and biological sampling strata for the summer 1992 west coast EIMWT survey, Miller Freeman cruise 92-8.

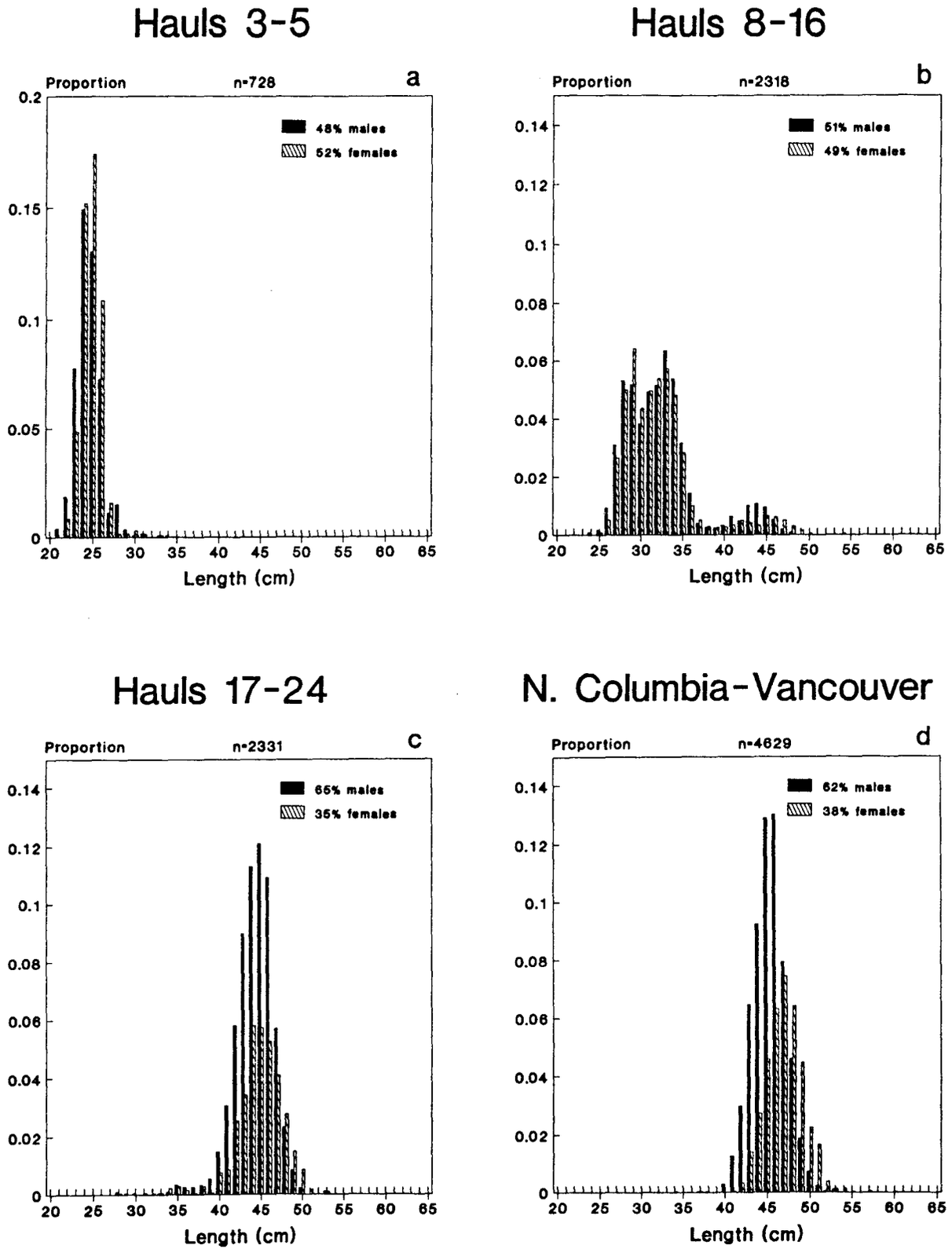

Figure 2. Preliminary whiting size and sex compositions from the summer 1992 west coast EIMWT survey, Miller Freeman cruise 92-8, as determined from midwater trawl samples.

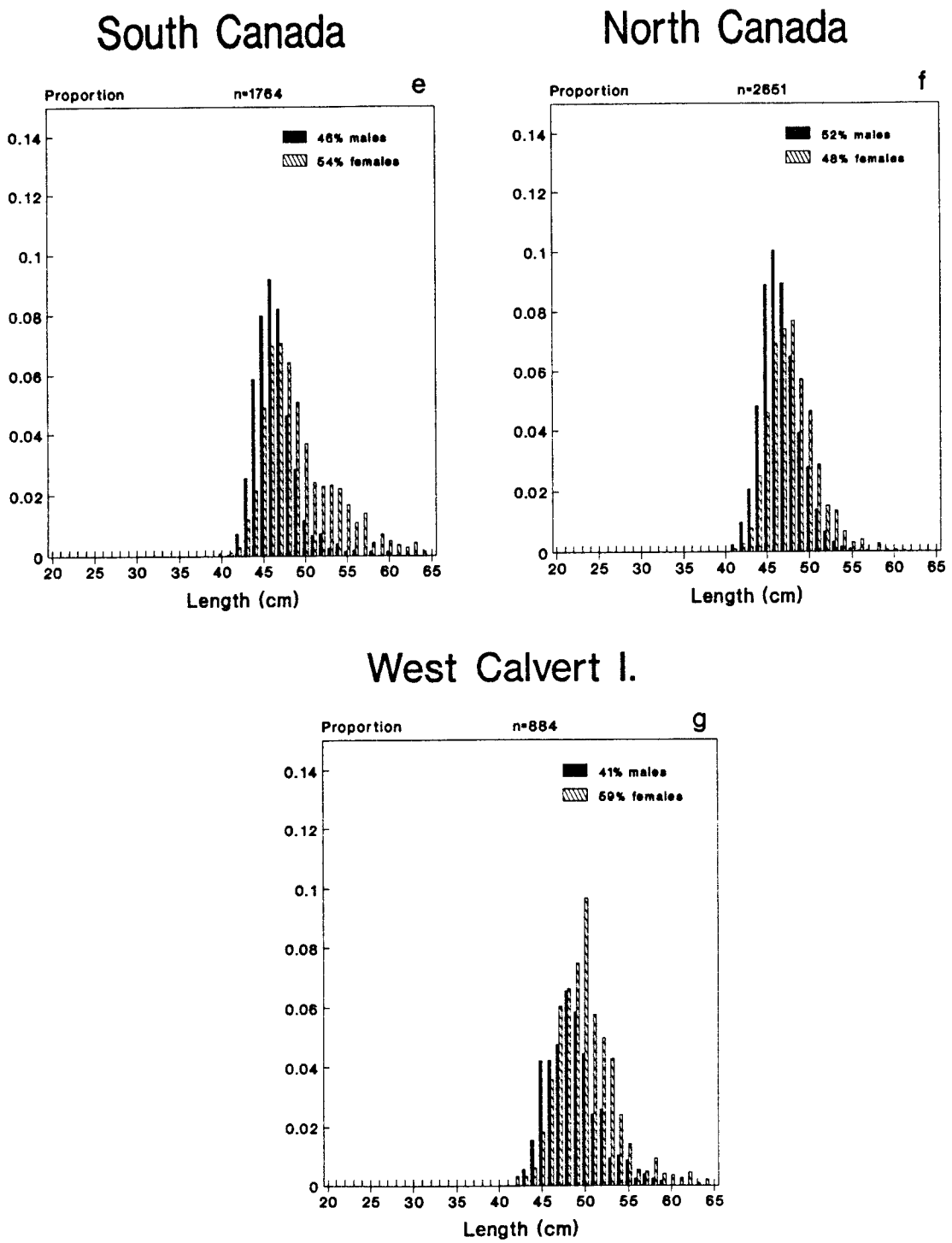

Figure 2. - Continued.